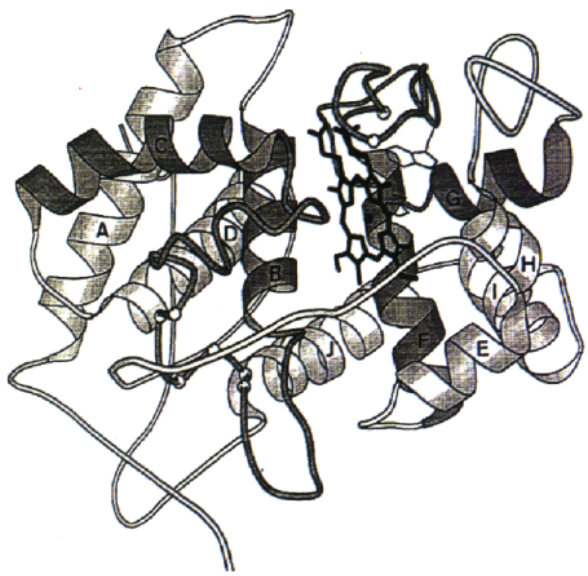
Environmental Technology

effective, less–expensive remediation therapies

As we become increasingly aware of how our activities alter the world's ecosystems, we realize how urgently we need technologies that help identify, characterize, monitor, control, and remediate pollutants. Transforming the results of basic research into commercially attractive strategies for remediation is particularly important — and it is an objective BES scientists and industry are working on together.

One of the most daunting tasks is cleaning up wastes generated by nuclear weapons production. In such cases, choosing the most effective remediation strategy demands a clear understanding of the waste site and of the nature of the contamination. In these ways, BES researchers have helped industry develop several accurate, rapid environmental technologies for locating, measuring, and recovering highly toxic materials, such as uranium and strontium.

Innovation is another key to success. For example, BES developed a new class of "reusable" resins that selectively remove heavy metals from chemical plant waste streams more efficiently than earlier products. Several companies are now using a BES-devised technique called "thermally enhanced soil venting" to improve the removal of volatile chemicals from contaminated sites. Researchers found that even modest soil temperature increases, achieved by hot-air injection, can considerably enhance the separation process and thus lower the costs of remediation.

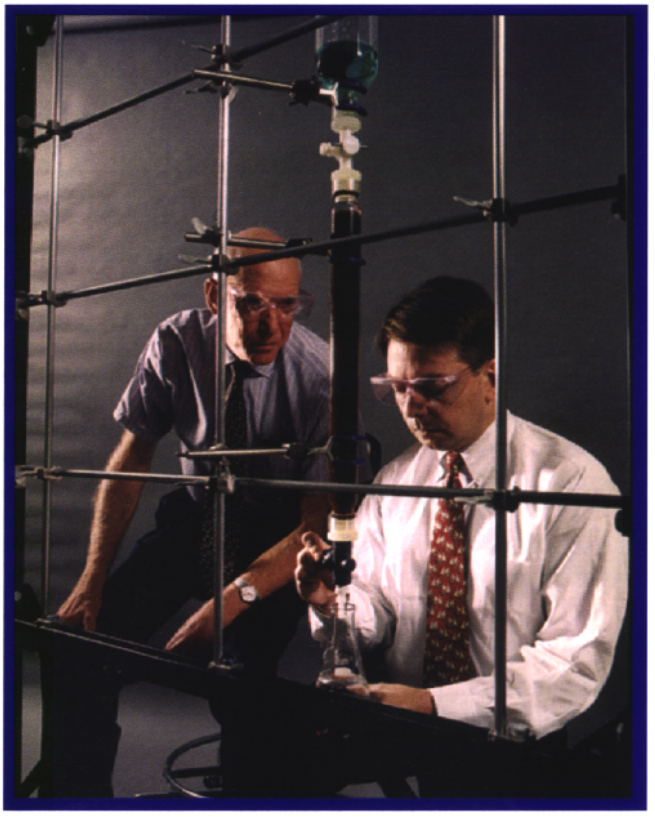


Enzymol International called on the expertise and resources of Lawrence Berkeley National Laboratory scientists to help define and refine the properties of a peroxidase enzyme the company developed. This enzyme holds great promise for commercial use because it degrades highly toxic waste chemicals such as PCBs (polycholorobiphenyls) and CPCs (chlorophenols). These persistent and damaging chemicals have, so far, resisted detoxification.

Probably the most desirable alternatives to conventional waste treatments are safe and effective bioremediation techniques that use natural processes to neutralize wastes. In one project, BES researchers are working with industry to develop an effective way to use a soybean enzyme that can break down PCBs and other toxic chemicals, Enzyme treatments have several advantages: one can easily access the target compound, very low levels of a pollutant can be treated, and the amount of enzyme used can be varied according to the concentration of the pollutant.

Treating Waste

Argonne National Laboratory has developed a new method for treating waste that contains a mix of radioactive materials and other chemicals. This new method allows these mixed components to be more effectively separated and disposed of. In initial trials with an ion-exchange resin (developed by Argonne), the uranium in a waste solution not only was reduced 300,000-fold (to a level within the acceptable limits for drinking water), but also was subsequently extracted and purified. The Eichrom Company has since commercialized the process (pictured here).



Contaminant Analysis

Scientists from the Westinghouse Savannah River Company are using X-rays from Brookhaven National Laboratory's National Synchrotron Light Source to study the location, concentration, and chemical form of toxic compounds within contaminated soils from nuclear processing facilities. The chemical sensitivity of the NSLS X-ray microscope is illustrated by these graphs, obtained by Brookhaven researchers, which show the distribution of strontium and lead in a 50-micron-thick section of human bone.